NOTES ON THE BIOLOGY OF *CINARA ABIETICOLA* (CHOLODKOVSKY) IN MAINE AND DESCRIPTIONS OF SEXUALES (HOMOPTERA: APHIDIDAE)[1]

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ABSTRACT: Notes are presented on the biology of *Cinara abieticola* (Cholodkovsky). A technique for collecting alate males is described, and a detailed description of sexual forms is given.

DESCRIPTORS: Homoptera, *Cinara abieticola*, balsam fir, collecting technique, description of sexuales.

In a brief review of the synonomy and characteristics of *Cinara abieticola* (Cholodkovsky), Hottes (1960) stated that the species had been collected on *Abies, Picea,* and *Cedrus.* Eastop (1972) lists 11 species of *Abies* and *Cedrus deodora* (Roxb.) Loud. as hosts of *C. abieticola.* Bradley (1951) noted that each species of *Cinara* in eastern Canada was restricted to a single plant species or to plants of the same genus. The feeding sites, in early spring, late spring and summer, of *C. abieticola* on balsam fir, *Abies balsamea* (L.) Mill. are recorded by Bradley (1959), and other biological information on the species is recorded by Bradley (1961). Recently some additional information on the biology of this aphid on balsam fir has been collected and is reported in this paper. A technique for collecting males and descriptions of the apterous oviparous female and alate male are included.

BIOLOGICAL NOTES

Life Cycle and Behavior

Many colonies of *C. abieticola* were periodically observed in Old Town, Maine in 1971. Stem mothers were first observed on May 15 at the bases of buds. The aphids were generally found near the top of the small trees on the first branch whorl. Usually there were

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one or two per branch, with a maximum of six being noted. Young nymphs were present on May 27, and by June 7 colonies were quite large and summer viviparae common. Colonies were generally located on the trunk just below the first whorl of branches.

Bradley (1961) noted that three species of *Cinara* including *C. abieticola* dropped when disturbed and that it seemed to be a predator escape mechanism. In our studies, when colonies were disturbed by shaking the tree or by touching some of the aphids, nearly the entire colony dispersed. Many apterous females dropped but others moved in all directions; up and down the stem and out on the branches. Dispersal was rapid and indeed appeared to be an excellent predator escape mechanism. Aphids often reformed in small groups on various portions of the trunk. Continuous observation of many colonies showed that these aphids frequently shifted position on the tree.

Colonies on fir trunks began to decline by mid-June as aphids moved to the root collar and roots. Some additional dispersal of apterous forms was noticed as they established themselves on the roots of nearby trees. Nearly all the colonies had left the trunks by June 19, but occasionally a colony persisted until the latter part of June. Bradley (1961) stated that few alates were seen even though the second generation was about half alatoid nymphs. He was quite certain that the alate females went directly to the roots of their new host tree, although Bradley did not observe the aphids doing so. We observed only two alate females in mid-June on the aerial portion of the tree and none were ever seen on the roots.

Apterous oviparae and eggs were first observed on October 12 and oviparae were observed as late as October 28. Oviparae were usually located at the bases of buds on the current years' tree growth.

Technique for Collecting Alate Males

When populations were low, an occasional alate male was found near an oviparous female in October, but many more were collected by use of the following technique. In early June a one gallon cardboard can was cut down one side and half way across the bottom and placed around the trunk of a small fir tree about

four feet above the ground. The sides and bottom were then stapled together. The can, minus the top, was then nearly filled with soil and litter to simulate the natural soil and litter layers. If aphids were not already present on the terminal portion of the tree, they were introduced from other trees. In mid-June, at the usual migration time, they moved down the stem to the artificial litter layer and established colonies on the trunk instead of on the roots. When the colonies were established, the entire top portion of the tree, including the can, was caged using a fine meshed nylon cloth.

Natural root colonies were transient. Most did not last more than 3-4 weeks, possibly because of predation. Caging colonies on the stem prevented predation, and regardless of the reason, provided a stable colony that could be easily observed for the remainder of the season.

Oviparous females in caged colonies moved to the terminal portions of the tree in October in the normal manner. Bradley (1961) mentioned that males developed on roots in the fall and then moved up to the tops of trees to mate. For some unknown reason males were not produced in our two caged colonies as expected. However, many alate males from other trees outside the cages were attracted to oviparous females inside. They landed on the outside of the cage where they were easily collected. Many males were collected in this manner even when populations were very low and when males were nearly impossible to locate otherwise in the field. When the cage was removed, males were attracted to and copulated with oviparae. Eggs were laid and colonies developed on the trees the following spring. This collecting technique would probably work for other *Cinara* with similar habits and should be particularly useful when populations are low.

Natural Enemies

Bradley (1961) recorded species of attending ants, parasites, and predators of *C. abieticola* as did Heikinheimo (1963). We found larvae of *Metasyrphus medius* (Jones) (Diptera: Syrphidae) occasionally feeding on *C. abieticola* in June and unidentified cecidomyiid larvae were also seen within these colonies. Comparatively few observations were made when aphids were on the roots

but a lacewing larva, possibly a hemerobiid, was noted in one colony. None of these predators have previously been associated with *C. abieticola.*

DESCRIPTION OF SEXUALES

Wellenstein (1930) published a brief description of the alate males and oviparae of *C. abieticola.* Collection data was not given, but was presumably from Germany. The type specimens are unknown and are presumed lost. *C. abieticola* is evidently holarctic in distribution and quite variable in the characteristics, hosts, and behavior. For these reasons it seems best to give a more complete description of the sexuale forms studied in this work.

Male. Color: – Antennal III light brown or basal half light brown and rest brown; IV, V, VI light brown. Fore femur basal half light and rest light brown; mid femur basal 1/3 light and rest brown; hind femur basal half light and rest brown. Tibiae brown. Abdomen light. Cornical dark brown.

Measurements: (All measurements are in millimeters, mm). Length of body, 2.54-3.06. Width of head, 0.61-0.73. Length of rostrum, 1.30-1.37; segment IV, 0.162-0.189; V, 0.081. Length antennal segments: III, 0.61-0.62; IV, 0.297-0.32; V, 0.30-0.32; VI, 0.23-0.259; unguis, 0.05-0.06. Width antennal segment III, 0.043-0.048. Length segments of hind legs: femur, 1.08-1.28; tibia, 1.84-2.07; tarsal I, 0.081-0.097; II, 0.297-0.35. Width of hind tibia, 0.064-0.075; width of cornicle, 0.216-0.297. Length of setae: head, 0.081-0.10; antennal III, 0.108-0.16; hind tibia, 0.160-0.20; hind tarsal II, 0.086-0.118; dorsum of abdomen, 0.102-0.108; cornicle, 0.075-0.097; eighth abdominal segment, 0.097; cauda, 0.102-0.13, genital plate, 0.075-0.08.

Structures: Male is alate. Number of sensoria: antennal III, 40-51; IV, 11-20; V, 7-13. Number of setae: base antennal VI, 9-10; each side rostral segment IV, 3-4; eighth abdominal tergum, 21-22; genital plate, many. One sensory peg on first segment of all tarsi.

Oviparous Female. Color: Antennal III, light with dark tips; IV, light base and dark apex; V, basal half light and rest brown; VI, brown. Femora basal 2/3 light and rest light brown. Tibiae, light with dark apex. Abdomen, light with two rows of black dots. Cornical brown.

Measurements: Length of body, 3.44-3.98. Width of head, 0.77-0.84. Length of rostrum, 1.96-2.02; segment IV, 0.23-0.243; V, 0.085-0.10. Length antennal segments: III, 0.57-0.68; IV, 0.25-0.28; V, 0.03-0.324; VI, 0.22-0.232; unguis, 0.054-0.059. Width antennal segment III, 0.055-0.064. Length segments of hind leg: femur, 1.47-1.62; tibia, 2.40-3.82; tarsal I, 0.08-0.11; II, 0.32-0.35. Width of hind tibia, 0.14-0.15; width of cornicle, 0.43-0.54. Length of setae: head, 0.12-0.14; antennal III, 0.12-0.14; hind tibia, 0.12-0.17; hind tarsal II, 0.10-0.11; dorsum of abdomen, 0.11-0.16; cornicle, 0.06-0.08; eighth abdominal segment, 0.15-0.16; cauda, 0.16; genital plate; 0.09-0.11.

Structures: Hind tibia swollen and entire length almost covered with small sensoria. Number of sensoria: antenna III, 1-2; IV, 1-3; V, 2. Number of setae: base antennal VI, 8-9; each side rostral segment IV, 4-5; eighth abdominal tergum, 22-26; genital plate; many. One sensory peg on first segment of all tarsi.

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